

AIR REQUIREMENT FORMULAS

1. **SURFACE AIR CONSUMPTION RATE (SAC)** - (Answer in psi per min)
$$\text{SAC} = \frac{\Delta \text{PSI} \div \text{Time (mins)}}{\text{Depth (ATA)}}$$
2. **CYLINDER CONSTANT (k)** - (Answer is in Ft³ per psi)
$$k = \frac{V_r \text{ (Rated volume of cylinder in Ft}^3\text{)}}{P_r \text{ (Rated pressure of cylinder in psi)}}$$
3. **RESPIRATORY MINUTE VOLUME (RMV)** – (Answer in Ft³ per minute measured at the surface)
$$\text{RMV} = \text{SAC} \times k$$
4. **CONSUMPTION RATE AT DEPTH (Cd)** – (Answer in Ft³ per minute measured at depth)
$$\text{Cd} = \text{RMV} \times \text{depth (ata)}$$
5. **DELIVERABLE VOLUME (Vd)** - (Answer in Ft³)
$$V_d = P_g \times k$$

$$P_g = \text{Cylinder pressure}$$

$$k = \text{Cylinder constant}$$
6. **AVAILABLE VOLUME (Va)** - (Answer in Ft³)
$$V_a = N(P_g - P_m)k$$

$$N = \text{Number of cylinders}$$

$$P_g = \text{Cylinder pressure}$$

$$P_m = \text{Cylinder reserve}$$
7. **TOTAL AIR REQUIREMENT (TAR)** - (Answer in Ft³)
$$\text{TAR} = \text{Total Dive Time (TDT)} \times \text{Consumption rate at depth (Cd)}$$
8. **CYLINDER DURATION (Da)** – (Answer in minutes)
$$D_a = \frac{V_a}{C_d}$$

$$V_a = \text{Available volume}$$

$$C_d = \text{Consumption rate at depth}$$